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Nos. 80-1208, 80-1471 and 80-1610.

In the Supreme Court of the United States.

OCTOBER TERM, 1980.

NEW ENGLAND POWER COMPANY,
APPELLANT,
v.
NEW HAMPSHIRE PUBLIC UTILITIES COMMISSION, ET AL.,
APPELLEES.

COMMONWEALTH OF MASSACHUSETTS, et al.,
Appellants,
v.
NEW HAMPSHIRE LEGISLATIVE UTILITY CONSUMERS' COUNCIL,
APPELLEE,

DENNIS J. ROBERTS II, ET AL.,
APPELLANTS,
v.
NEW HAMPSHIRE PUBLIC UTILITIES COMMISSION, ET AL.,
APPELLEES.

ON APPEALS FROM THE SUPREME COURT OF THE STATE OF NEW HAMPSHIRE.

Joint Appendix.

[Listing continued on inside cover.]

Appeal docketed January 19, 1981 in No. 80-1208, February 27, 1981 in No. 80-1471, and March 23, 1981, in No. 80-1610.
Probable Jurisdiction noted May 18, 1981.

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Table of Contents.

1. Relevant Docket Entries
   a. New Hampshire Public Utilities Commission ("PUC") 1a
   b. New Hampshire Supreme Court ("NHSC") 1a
2. Orders of the New Hampshire Public Utilities Commission and Opinion and Judgment of the New Hampshire Supreme Court 4a
   a. New Hampshire Public Utilities Commission 4a
      (1.) Order No. 13,913 — instituting investigation (11-29-79) 4a
      (2.) Order No. 14,456 — denying NEP's motion to dismiss (8-27-80) J. S. App. 15a[1]
      (3.) Order No. 14,492 — prohibiting NEP from exporting hydroelectric energy (9-19-80) J. S. App. 25a
   b. New Hampshire Supreme Court Opinion and Judgment (12-23-80) J. S. App. 1a
3. Other parts of the record
   a. New Hampshire Public Utilities Commission ("PUC") 7a
      (1.) PUC: NEP Exhibit No. 1. Prefiled testimony of Russell A. Holden (1-29-80) 7a
      (2.) PUC: Rhode Island Exhibit No. 1. Prefiled testimony of Edward F. Burke (1-29-80) 24a
      (3.) PUC: NEP Exhibit No. 2. Prefiled testimony of Robert O. Bigelow (6-25-80) 29a

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[1] "J.S. App." refers to the appendix to the Jurisdictional Statement in No. 80-1208.

(4.) PUC: PUC Staff Exhibit No. 9. Prefiled testimony of Lisa Gertler, as amended by PUC Staff Exhibit No. 10, without schedules (6-25-80) 37a

(5.) PUC: Statement of George R. Gantz (7-8-80) 49a

(6.) PUC: NEP Exhibit No. 7. Prefiled rebuttal testimony of Robert O. Bigelow (7-29-80) 52a

b. New Hampshire Supreme Court ("NHSC") 58a

(1.) NHSC: Affidavit of Frederick J. Nemergut (10-22-80) 58a

(2.) NHSC: Supplemental Affidavit of Frederick J. Nemergut (11-5-80) 62a

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ON APPEALS FROM THE SUPREME COURT OF THE STATE OF NEW HAMPSHIRE.

Joint Appendix.

1. Relevant Docket Entries.

a. New Hampshire Public Utilities Commission ("PUC").

(1.) Order No. 13,913 — Instituting Investigation (11-21-79).

(2.) Motion to dismiss of New England Power Company ("NEP") (12-28-79).
(3.) Rhode Island request to intervene (1-11-80).
(4.) Massachusetts request to intervene (1-30-80).
(5.) Hearing before the PUC, Day 1 (1-29-80).
(6.) Hearing before the PUC, Day 2 (6-25-80).
(7.) Hearing before the PUC, Day 3 (7-8-80).
(8.) Order No. 14,456 — denying NEP's motion to dismiss (8-27-80).
(9.) Order No. 14,492 — prohibiting NEP from exporting hydroelectric energy (9-19-80).
(10.) Motion of NEP for Rehearing, Clarification, and Suspension of Order No. 14,492 (9-26-80).
(11.) Motion of Commonwealth of Massachusetts for Rehearing and Suspension (10-1-80).
(12.) PUC Order No. 14,517 — denying motions of NEP and Massachusetts (10-6-80).
(13.) Motion of State of Rhode Island for Rehearing and Suspension of Order (10-7-80).
(14.) PUC Order No. 14,525 — denying motion of Rhode Island (10-9-80).

b. New Hampshire Supreme Court ("NHSC").

(1.) NEP's Appeal by Petition pursuant to RSA 541:6 (10-8-80).
(2.) NEP's Motion for Suspension (10-8-80).
(3.) Order of NHSC granting NEP's Motion for Suspension, without prejudice, pending determination of appeal (10-10-80).

(4.) PUC's Motion to Remove Stay Placed on Commission Order No. 14,492 (10-14-80).

(5.) Legislative Utility Consumer Council's ("LUCC") Motion for Reconsideration Pursuant to Rule 22 (10-21-80).

(6.) Motion by Massachusetts to join as appellant pursuant to RSA 541:8 (10-22-80).

(7.) Hearing on pending motions (10-22-80).

(8.) Order of NHSC deferring decision on reconsideration of stay until argument on the merits (10-22-80).

(9.) Motion by Massachusetts for Remand to PUC to Hear New Evidence (11-10-80).

(10.) Order of NHSC denying Massachusetts' Motion for Remand (11-12-80).

(11.) Opinion and Judgment of NHSC (12-23-80).

(12.) NEP's Notice of Appeal to the Supreme Court of the United States (1-5-81).

(13.) NEP's Motion for Stay (1-5-81).

(14.) Massachusetts' Notice of Appeal to the Supreme Court of the United States (1-15-81).

(15.) NEP's Amended Notice of Appeal to the Supreme Court of the United States (1-12-81).

(16.) Rhode Island's Notice of Appeal to the Supreme Court of the United States (1-9-81).

(17.) Rhode Island's Motion for Stay (1-9-81).

(18.) Order of NHSC denying Motions of NEP and Rhode Island for Stay (1-14-81).

2. Orders of the New Hampshire Public Utilities Commission and Opinion and Judgment of the New Hampshire Supreme Court.

a. New Hampshire Public Utilities Commission.

(1.) Order No. 13,913 — instituting investigation (11-29-79).

DE 79-223 NEW ENGLAND POWER COMPANY
ORDER NO. 13,913

WHEREAS, NH RSA 374:35 states the following:

> Transmitting Electricity Out of the State
>
> 374:35 Permission Required. No corporation engaged in the generation of electrical energy by water power shall engage in the business of transmitting or conveying the same beyond the confines of the state, unless it shall first file notice of its intention so to do with the public utilities commission and obtain an order of said commission permitting it to engage in such business. Any such corporation engaged in the business of transmitting or conveying such electrical energy beyond the confines of this state pursuant to such order shall discontinue such business in whole or in part, to such extent and under such conditions as the commission may order, whenever, after notice to such corporation and hearing thereon, the commission shall find that such electrical energy or the portion thereof affected by said order is reasonably required for use within this state and that the public good requires that it be delivered for such use.

WHEREAS, The New England Power Company presently transmits hydro capacity beyond the confines of the State;

WHEREAS, the rated capacity of these New England Power hydro units is in excess of 300 MW; and

WHEREAS, 300 MW of hydro capacity represents between ¼ and ⅓ the electrical peak demand of the State of New Hampshire; and

WHEREAS, the present fuel adjustment clauses of electrical utilities within the State are rising rapidly due to escalation in the price of oil and temporary shutdowns of nuclear units for repairs;

WHEREAS, the oil situation appears to be worsening; and

WHEREAS, the interests of New Hampshire towns existing near the hydro facilities operated by New England Power may have changed since the Commission first approved the transfer of hydro power outside the boundaries of the State of New Hampshire; and

WHEREAS, the New Hampshire General Court has recently passed RSA 362-A to encourage greater use of hydro capacity in meeting the electrical demands of New Hampshire consumers; and

WHEREAS, for the aforementioned reasons, the public good requires the Commission to investigate the question of whether or not to discontinue the transmission of this hydro energy outside the State of New Hampshire; and

WHEREAS, pursuant to RSA 374:35, 374:4, 378:7, 365:19 and 365:28, the Commission has the right to initiate its own investigation, a duty to keep informed, and the right to alter prior orders to conform with changing circumstances; it is hereby

ORDERED, that Docket No. DE 79-223 is hereby opened for the investigation into whether or not the Commission shall alter its approval, in whole or in part, of the transfer of hydro electricity outside the boundaries of New Hampshire; and it is

FURTHER ORDERED, that the aforementioned docket will include an investigation into whether or not New Hampshire electric utilities, towns, cities, cooperatives, or the State itself, should have greater access to this hydro power to meet electrical demand within the State of New Hampshire; and it is

FURTHER ORDERED, that New England Power shall file testimony as to why the Commission should not alter its operation of these facilities, in whole or in part, by December 28, 1979; and it is

FURTHER ORDERED, that any other interested party file testimony in favor or in opposition to such alteration by January 14, 1980; and it is

FURTHER ORDERED, that hearings will commence at 9:30 A.M. on January 29, 1980 at the office of the Commission, 8 Old Suncook Road, Concord, New Hampshire.

By order of the Public Utilities Commission of New Hampshire this twenty-first day of November, 1979.

/s/_____
Vincent J. Iacopino
Executive Director and Secretary

3. Other parts of the record.

a. New Hampshire Public Utilities Commission ("PUC").

(1.) PUC: NEP Exhibit No. 1. Prefiled testimony of Russell A. Holden (1-29-80).

• • •

1. Q. Please state your full name, business address and position with the respondent New England Power Company.
   A. I am Russell A. Holden, my business address is 4 Park Street, Concord, New Hampshire, and I am Vice President of New England Power Company.
2. Q. Does New England Power Company contest the jurisdiction of the New Hampshire Public Utilities Commission to prohibit or restrict the company's transmission out of New Hampshire of power generated by the company at its hydroelectric facilities within New Hampshire?
   A. Yes, it does. The company has filed a motion to dismiss this proceeding for lack of jurisdiction. In filing this testimony concerning its hydroelectric facilities, New England Power Company does not waive its objection to the Commission's jurisdiction.
3. Q. How long have you been associated with New England Power?
   A. Since mid-1967 — over 12 years.
4. Q. Have you been involved in the company's business in New Hampshire over that period?
   A. Principally, in the company's business in New Hampshire and Vermont.
5. Q. Please outline your responsibilities as they pertain to New England Power.

A. New England Power is the wholesale generation and transmission subsidiary of the New England Electric System, a public utility holding company. As such, it generates electricity in bulk and buys electricity in bulk from other generating companies and transmits and sells such electricity, again in bulk, to the three affiliated retail distribution subsidiaries of the New England Electric System; Granite State Electric Company in New Hampshire, Massachusetts Electric Company in Massachusetts and The Narragansett Electric Company in Rhode Island. New England Power also transmits and sells electricity at wholesale for resale to some 30 non-affiliated distribution utilities. Among these are the New Hampshire Electric Cooperative and the Littleton Water and Light Department of Littleton, New Hampshire. The majority are municipal light departments of cities and towns in Massachusetts. The company participates in a number of interchange and economy transactions as well.

New England Power's generating and transmission facilities include hydroelectric generating projects and transmission lines and associated facilities in New Hampshire and Vermont, as well as generating facilities and transmission lines in Massachusetts. I am charged with executive responsibility for the company's business in New Hampshire and Vermont.

6. Q. Do you have responsibilities with respect to any other companies in New England Electric System?

A. I am also President and Treasurer of Granite State Electric Company and am charged with executive responsibility for its retail distribution business in some 23 cities and towns in New Hampshire. Granite

State purchases its entire supply of electricity at wholesale for distribution and resale from New England Power.

7. Q. Will you briefly outline the history of New England Power's hydroelectric activities on the Connecticut River?

A. They date back to 1907, when construction of the first hydroelectric project on the Connecticut River was commenced at a site between Hinsdale, New Hampshire and Vernon, Vermont. The Vernon project, as it is generally known, began operation in 1909, with the electricity generated there transmitted over 69 kV lines to industrial customers in Central Massachusetts. Vernon is still operating, over 70 years later. It now contains 10 generating units with a net capability of 28.5 MW. Eight of these units are located in New Hampshire and 2 in Vermont.

The next project on the Connecticut River was at Bellows Falls. At that site, New England Power is the successor to a company formed in 1792 to make the Connecticut River navigable around Bellows Falls by installing a system of locks and canals. The Bellows Falls project commenced the generation of electricity in 1928. It contains 3 generating units having a net capability of 49.0 MW, all of which are in Vermont.

The largest conventional hydro projects on the Connecticut River, and in New England for that matter, are New England Power's Comerford and Moore Stations on the upper part of the river. Comerford, which contains 4 generating units having a net capability of 167.0 MW, all of which are located in New Hampshire, commenced operations in 1930.

At about the same time, New England Power constructed the McIndoes Station, a small project with a

net capability of only 13.0 MW, all in New Hampshire, which has the specific purpose of regulating flows of water further down river by retaining some of the discharge from Comerford when it is operating at or near capacity.

Wilder Station, located between Wilder, Vermont and Lebanon, New Hampshire, went on line as the company's fifth Connecticut River project in 1950. Wilder has 2 units with a net capability of 36.0 MW. One unit is located in New Hampshire and one in Vermont. Wilder is at a site known as Olcott Falls, which was formerly the location of the Olcott Paper Company.

The last New England Power Company hydroelectric generating station to go on line on the Connecticut was Moore Station, which began operations in 1957. Like Comerford, Moore has 4 generating units with a net capability of 199.0 MW. All are located in New Hampshire.

8. Q. Does the company have any other hydroelectric projects?

A. Yes. They are all associated with the Deerfield River. The newest and largest is the Bear Swamp pumped storage project in Rowe, Massachusetts, with 2 units, each with a net capability of 300.8 MW. Bear Swamp began operations in 1974. Associated with Bear Swamp is a small river regulating project of 7.5 MW net capability called Fife Brook. In addition, there are a number of older projects in Massachusetts and Vermont. In Massachusetts, there are five stations in addition to the two previously mentioned. They are Deerfield No. 2, No. 3 and No. 4, each with a net capability of approximately 6.0 MW; No. 5, with a net capability of 15.5

MW and Sherman, with a net capability of 7.0 MW. In Vermont, there are two stations, Harriman, with 43.0 MW net capability and Searsburg, with a net capability of 5.0 MW.

9. Q. Who regulates the activities of New England Power?

A. New England Power is engaged primarily in the generation and transmission of electricity for sale at wholesale for resale in interstate commerce. Its wholesale rates are comprehensively and exclusively regulated by the Federal Energy Regulatory Commission ("FERC") under Part II of the Federal Power Act. The company also makes a small number of direct industrial power sales, which aggregate only 2/10 of 1% of its business or 37 million out of 16.7 billion kilowatthours. These sales are subject to regulation by the commissions of the states in which they are made.

With respect to its licensed hydroelectric power projects, of which four projects comprising six generating stations are located on the Connecticut River between New Hampshire and Vermont, the company is under the jurisdiction of FERC under Part I of the Federal Power Act.

Projects licensed under the Federal Power Act are also subject to federal controls with respect to navigation and navigational aids, installation of fishways and recreational areas, and they may also be subject to orders of the water resources boards or commissions of the states in which they are located.

New England Power's issues of securities are regulated by the Securities and Exchange Commission ("SEC") under the Public Utility Holding Company Act of 1935 and by the regulatory commissions of Massachusetts, New Hampshire, Vermont and, to some extent, Connecticut.

Also, the company's activities, as they might involve the safety of the electric facilities which it owns and/or operates, are under the jurisdiction of the state utilities commissions and in some cases of other state agencies, such as departments of public safety.

10. Q. Do all New England Power's hydroelectric projects operate more or less independently?

A. Just the opposite. For at least the last 40 years, the New England Electric System electric companies have operated as an integrated system and have been so regarded by both the SEC under the Holding Company Act and by the Federal Power Commission ("FPC"), which is now FERC.

Hydroelectric generation in New England is basically a peaking proposition. Except when seasonal or unusual weather conditions permit, our hydroelectric generating stations are operating mainly to meet peak load requirements on the system.

Base load requirements, on the other hand, are met from New England Power's steam-electric stations at Brayton Point and Salem, Massachusetts, plus, to some extent, Narragansett Electric Company's steam stations in Providence, Rhode Island, as well as from the four Yankee nuclear companies in which New England Power is a stockholder. These are Yankee-Rowe, Connecticut Yankee, Vermont Yankee and Maine Yankee.

11. Q. Do the New England Electric System companies operate this integrated system in isolation from other New England utilities?

A. No, they do not. As the Commission knows, virtually all the New England electric utilities, both investor-owned and of the public power variety — municipals, co-ops, etc. — are members of the New

England power pooling arrangement known as NEPOOL.

NEPOOL as an organization was formalized by the signing of the NEPOOL agreement on September 1, 1971. The agreement provides for the totally coordinated operation of the interconnected bulk power supply system in New England. It also provides for joint planning on a regional basis, to meet future needs.

The NEPOOL agreement was filed with the FPC, now FERC, and was investigated by FPC and subsequently approved, in an adversary proceeding. The objectives of NEPOOL, both near- and long-term, are to enable all the electric utilities in New England, large and small, with or without their own generating capacity, to obtain an equitable share of such benefits as reliable interconnection, economies of scale, emergency protection, long-range planning, and the like.

In 1975, the New Hampshire legislature enacted what is now Chapter 374A of the Revised Statutes, in order to facilitate future participation of New Hampshire utilities in regional scale generation and transmission facilities, both within and outside New Hampshire. Under Chapter 374A, electric utilities in New Hampshire can become part owners of generating and transmission projects in other states and utilities operating in other states can be part owners of projects in New Hampshire. The legislation also authorizes participation in necessary financings, power purchase commitments, etc. Similar legislation has been enacted in Massachusetts, Rhode Island, Connecticut and Maine.

12. Q. Mr. Holden, speaking as an official of New England Power, do you believe that the New Hampshire

Public Utilities Commission should, if it has the power to do so, prohibit or restrict the export by New England Power of hydroelectric power generated by it in New Hampshire?

A. No, I do not. Entirely apart from the issue of the Commission's jurisdiction, to which I have referred, such action would tend to bring about the Balkanization of the utility resources of each of the New England states.

While hydroelectric energy is not vulnerable to the present day rapid escalation of fuel prices, it is severely restricted in New England by predominantly seasonal variations in river flow and in most cases can only be used effectively as a source of peaking power. This is illustrated by the fact that over the calendar year 1978, as shown in the annual report of the New England Power Exchange, or NEPEX, conventional hydroelectric capacity represented 14% of the generating capacity in New England but had only enough river flow to produce 5% of the region's total electric energy requirements.

The development of our six-state regional interconnected system came about, to a large extent, because of the benefits in both improved reliability and reduced costs which all participants realized from interchanging power between the several states. This is of particular importance to areas producing hydroelectric power which can be exported over short periods, for peaking purposes, and for a longer period during the annual spring run-off, but which must import base load energy from thermal stations during many hours of the year. If New Hampshire were to ban the exportation of hydro power, other states might understandably take the

position that they should not permit base load generation within their borders to be transmitted into New Hampshire to meet its needs either for base load capacity or, indeed, when water conditions prevent generating any significant amount of hydro power at all, as is not uncommon during the summer months.

Furthermore, from the standpoint of achieving the most adequate, reliable and economic supplies of electricity throughout New England, the achievements of NEPOOL would be all but lost, as would the benefits of the integrated grid system which links all parts of our six-state region and the central dispatch which makes it operate on the most economic and reliable basis. The New England Electric System companies would have to reappraise and revise their methods of operation and New England Power Company, in particular, would have to revise its wholesale pricing policies as well.

Of course, as a practical matter, flows of power in an interconnected system cannot be controlled. Consequently, short of isolating electric facilities in New Hampshire from those in neighboring states, there is no way physically to prevent power generated at a New England Power hydroelectric station in New Hampshire from being transmitted to a point outside the state.

13. Q. Mr. Holden, from your position as chief executive of Granite State Electric Company, would you view a prohibition or restriction on the exporting of New England Power's New Hampshire hydro generation to points outside the state as potentially beneficial to Granite State?

A. No, I do not believe it would be beneficial. Presently, Granite State purchases all of its requirements for

electricity to supply to its customers from New England Power. The purchase is under a tariff, including rates and terms and conditions of service, which is identical to that used for the sale of primary firm power to other affiliated and non-affiliated customers of New England Power. I do not believe that Granite State's best interests would be served by an attempt to monopolize the hydro portion of New England Power's mix for the benefit of New Hampshire customers.

14. Q. Mr. Holden, do you believe that all the requirements of Granite State's customers could be met from the hydroelectricity which New England Power generates in New Hampshire?

A. I do not believe so, although there would of course be times when it would be more than enough. However, as I commented earlier, availability of hydro power is unpredictable and there would be periods when New England Power's hydrogeneration would be so minimal that it would be far from sufficient to supply Granite State's load. In addition, there is a great disparity in size between New England Power's total hydrogeneration in New Hampshire, both in terms of MW of capacity and kilowatthour production, and Granite State's load and total kilowatthour purchases. New England Power has about 420 MW of capacity in New Hampshire which produces about one billion kilowatthours a year. Granite State's peak load is only about 75 MW and its purchases about 400 million kilowatthours.

15. Q. How would Granite State meet its requirements at times when New England Power's hydrogeneration in New Hampshire was insufficient to meet Granite State's electrical requirements?

A. When the available hydrogeneration was insufficient to meet Granite State's load in any district, the difference between the load in each district and the amount of energy supplied by hydro would have to be furnished under what is usually referred to as a partial requirements contract.

16. Q. If it becomes necessary for Granite State to enter into new power purchase arrangements with New England Power, such as a partial requirements contract, would this new arrangement be subject to FERC's rate jurisdiction?

A. Yes, it would. All of New England Power's sales of electric energy at wholesale for resale, whether the energy comes from hydroelectric generating projects or from fossil fueled or nuclear plants, are subject to the rate jurisdiction of FERC. This would be the case, as I understand it, even if the New Hampshire Commission could lawfully exercise jurisdiction to prohibit or restrict the exportation of some of the company's hydrogeneration.

17. Q. Do you believe that a prohibition or restriction by the New Hampshire Commission on New England Power's hydro generation exports would be of financial benefit to the utilities of the state, or their customers?

A. No, I do not. Assuming for the sake of discussion that the Commission could lawfully impose such a restraint and the company could operate in compliance with it, so far as I am aware it would only affect the physical act of transmitting electric energy. As long as New England Power remains in the business of generating, transmitting and selling electric energy at wholesale for resale in interstate commerce, it will be a "public utility" as defined in Part

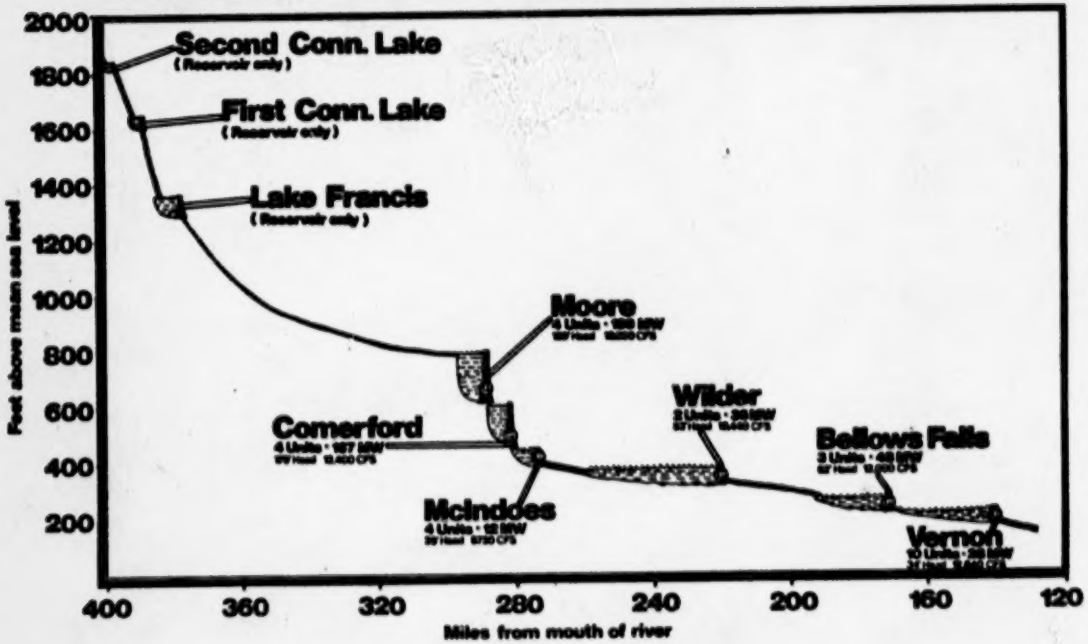
II of the Federal Power Act, and its wholesale rates will be exclusively regulated by FERC.

The Federal Power Act prohibits public utilities from treating any customers preferentially or subjecting others to prejudice or disadvantage. It specifically prohibits any unreasonable differences in rates as between localities or as between classes of service.

FERC — and FPC before it — has consistently required uniform rates for all customers taking similar service under similar conditions, regardless of whether some of them were located near hydroelectric stations, or fossil fuel fired stations, or remote from any power source at all. The rates have always been set on the basis of New England Power's overall costs, not on the source from which the customer receives power.

19. Q. Does this complete your testimony at this time?
A. Yes.

CONNECTICUT RIVER HYDRO



NEP Exhibit 1A.

NEES Hydro

	YEAR BUILT	NO. UNITS	MAN-POWER	HEAD (FT.)	CAPACITY (MW)
CONN. RIVER					
MOORE	1956	4	0	159	199
COMERFORD	1930	4	40	179	167
McINDOES	1931	4	0	29	12
WILDER	1950	2	18	53	36
BELLOWS FALLS	1928	3	18	62	48
VERNON	1909/21	10	24	34	28
DEERFIELD RIVER					
SEARSBURG	1922	1	0	232	5
HARRIMAN	1924	3	35	390	43
SHERMAN	1927	1	0	80	7
NO.5 STATION	1915/74	1	0	182	16
FIFE BROOK	1974	1	0	112	8
NO.4 STATION	1912	3	26	68	6
NO.3 STATION	1912	3	0	68	6
NO.2 STATION	1913	3	0	63	6
TOTAL CONV. HYDRO		43	161		585
BEARSWAMP	1974	2	0	730	602

NEP Exhibit 1B.

NEES Conventional Hydro

Annual Production & Precipitation

NEP Exhibit 1C.

SUMMARY OF NEW ENGLAND POWER COMPANY HYDRO PROJECTS

I. *NEP Hydro Projects On the Connecticut River*

Project	Capacity Located in New Hampshire		Capacity Located in Vermont		Total Project Capacity	
Name	No. Units	Total Capacity	No. Units	Total Capacity	No. Units	Total Capacity
Vernon	8	22.8 MW	2	5.7 MW	10	28.5 MW
Bellows Falls	-	-	3	49.0 MW	3	49.0 MW
Comerford	4	167.0 MW	-	-	4	167.0 MW
McIndoes	4	13.0 MW	-	-	4	13.0 MW
Wilder	1	18.0 MW	1	18.0 MW	2	36.0 MW
Moore	4	199.0 MW	-	-	4	199.0 MW
Conn. River Totals	21	419.8 MW	6	72.7 MW	27	492.5 MW

NEP Exhibit 1E.

Capacity Located in New Hampshire		Capacity Located in Vermont		Capacity Located in Massachusetts		Total NEP Capacity	
No. Units	Total Capacity	No. Units	Total Capacity	No. Units	Total Capacity	No. Units	Total Capacity
21	419.8 MW 35.2%	4	120.7 MW 10.2%	14	649.6 MW 54.6%		1190.1 MW 100%

(2.) PUC: Rhode Island Exhibit No. 1. Prefiled testimony of Edward F. Burke (1-29-80).

I am Edward F. Burke. My business address is 100 Orange Street, Providence, Rhode Island. I am Chairman of the Rhode Island Public Utilities Commission, and I also serve as Chairman of Rhode Island's Energy Coordinating Council.

I am appearing today on behalf of the State of Rhode Island in my capacity as Chairman of the Rhode Island Public Utilities Commission to express the State's views relative to the New Hampshire Public Utilities Commission's investigation relative to whether or not the Commission should prohibit the transmission of hydro-electric power generated by New England Power Company within New Hampshire to points outside the State.

I fully understand this Commission's concern about the rising costs of energy, which have had a major impact upon the life-styles of all Americans with a special impact upon those who live in energy-poor regions such as New England. Of particular concern to any Public Utilities Commission must be the dramatic increase in the cost of oil, which has resulted in sharp increases in the cost of electricity generated by oil-fired units. All Public Utilities Commissions must, therefore, examine alternative forms of electricity generation and ways and means by which generation requirements can be reduced through conservation and load-management techniques.

Today, as I understand it, this Commission will be looking into the possible applicability of RSA 374:35 to the issue of whether or not New Hampshire generated hydro-electric power should be retained within the State's borders. Clearly, the statute cited purports to give such discretion to this Commission. I am aware that the New England Power Company has filed a motion to dismiss which questions the constitutionality of the statute because of its effect on interstate commerce and also because the hydro-electric projects are licensed under certain sections of the Federal Power Act. I am certain that these issues will be carefully presented by competent

counsel and given equally careful consideration by this Commission. Counsel representing the State of Rhode Island will address this matter at an appropriate time.

I wish to point out, however, that RSA 374:35 was enacted by the New Hampshire legislature in a different era. In 1913, the electrical power needs of New Hampshire, Rhode Island and all other states were met principally by small size generating units, which abounded throughout the region. Many of those were hydro-electric facilities. As society grew more complex and as modern technology, industry and domestic consumption required increasingly larger amounts of electricity, more sophisticated methods of generation were developed. There developed not only systems of large scale generating facilities, principally of the fossil-fuel type, but also sophisticated transmission and distribution systems, which led to the development of the present interconnecting network throughout the New England region and other parts of the United States and Canada. This was followed in the 1960's and 1970's by the development of nuclear power plants in various parts of the New England-Northeast region.

The interdependence of one state upon another for electrical generation was brought dramatically to light by the famous blackout of November 1965, which had ripple effects from New York throughout New England and into the Province of Ontario. Subsequently, the Northeast Power Coordinating Council and the region's utilities closely examined the causes and effects of the blackout. The investigation eventually led to the creation in 1971 of the NEPOOL organization, which provides for the totally coordinated operation of interconnected bulk power supply systems in New England. It also provides for a joint effort as far as planning is concerned on a regional basis to meet the future electrical generation needs of New England. It is the purpose of NEPOOL to allow all the electric utilities of New England, both public and private, to

obtain an equitable share of the benefits of reliable interconnection, economies of scale, and system back up in emergencies. This system has worked with great success and, in my opinion, has benefitted the entire region. Essential to the workings of this system has been the premise that power wherever generated may be dispatched within the region instantaneously as the need arises on the grid system with appropriate credits and debits being made relative to the costs of generation to the customer receiving the electricity.

In support of the NEPOOL concept, the New England states have worked closely with electric utilities to develop emergency conservation and load shedding plans to reduce the impact on society of shortfalls in supplies of fuel necessary for energy generation.

In the last several years, the New England Governors through the New England Regional Commission and the New England Conference of Public Utilities Commissioners Inc. have been exploring ways and means of bringing to the New England region, at a reasonable price, substantial amounts of hydro-electric power from Quebec, and hopefully from other regions of Eastern Canada. In fact, at their June 1979 meeting, the Eastern Canadian Premiers and the New England Governors instructed the Northeast International Committee on Energy, including New Hampshire's representative, the distinguished Professor John Carroll of the University of New Hampshire, to examine ways and means of developing increased electricity exchanges between New England and the Eastern Canadian region.

At that meeting, the Governors and Premiers adopted a unanimous resolution supporting the development of hydro-electric projects in Quebec, Newfoundland and the Bay of Fundy and pledged to maintain close liaison ". . . in the regional opportunities presented by these projects." At the urging of the New England Public Utilities Commissions, in-

cluding that of New Hampshire, NEPOOL has formed a special committee which has opened discussions with Hydro-Quebec relative to the possible purchase of electric power from that entity.

Last November, discussions were commenced between the Power authority of the State of New York and Hydro-Quebec with Vermont sitting in for the New England states on ways and means of developing improved transmission capability between Hydro-Quebec, New York and the New England states. There are also ongoing discussions between a number of New England states New York, New Jersey and Pennsylvania relative to the possible energy development opportunities that could be assisted by the creation of an Energy Corporation of the Northeast, more commonly known as ENCONO. One of the opportunities being explored is ways and means of developing and financing a system for the transmission of hydro-electric power from Canada.

We are living in an exciting age in which New England, Northeast Regional and Canadian-American cooperation on energy matters is gaining substantial momentum. New Hampshire, through its very able and distinguished Governor Hugh Gallen has been in the forefront of this movement. The ultimate goal of this effort is to provide reliable supplies of energy to the region at the lowest possible cost. There are examples outside of the electrical energy field which I am sure are well known to all of you. The regional initiatives of the New England governmental agencies have been based on a clear recognition of the interdependence of the New England states relative to electrical energy, an interdependence which is clearly reflected in the complex NEPOOL system. This system makes it possible for Rhode Island's Narragansett Electric Company to receive 6% of its purchased energy from hydro-units located in the State of New Hampshire. The withholding of significant amounts of electric power from the NEPOOL

system by any member utility or by any state action would, in my opinion, constitute a retreat from the many advances which I have described and would disrupt the workings of this finely tuned and highly efficient system. The effects of such action are very capably described in the prefiled testimony of Russell A. Holden, the Vice President of New England Power Company.

Thank you for affording me this opportunity to present these views.

(3.) PUC: NEP Exhibit No. 2. Prefiled testimony of Robert O. Bigelow (6-25-80).

1. Q. Will you please state your full name and business address?
   A. My name is Robert O. Bigelow. My business address is 25 Research Drive, Westborough, Massachusetts 01581.
2. Q. By whom are you employed and in what capacity?
   A. I am Vice President and Director of Planning and Power Supply of New England Power Service Company, which supplies many services, including professional engineering services, for companies in the New England Electric System. I am also a Vice President of New England Power Company.
3. Q. In filing this testimony, does New England Power Company waive its objection to the jurisdiction of the New Hampshire Public Utilities Commission over the company's exportation of hydroelectricity generated in New Hampshire?
   A. No, New England Power Company does not waive that objection.
4. Q. Would you describe your educational and professional background, please?
   A. I received my Bachelor of Science and Master of Science degrees from Massachusetts Institute of Technology in 1950 and joined the New England Electric System in that year. Since 1951, I have been active in the field of power system planning and computer applications. Also, I was engaged for two years in plant design and construction, and spent one year on loan to Mitre Corporation in the Computer Programming Division. From 1960 to 1968, I was in charge of the Engineering Studies Department of NEES, supervising System Planning Studies and Engineering Application of Computers. On January 1, 1969, I was appointed Chief Electrical Engineer of

NEES. On November 1, 1969, I was appointed Assistant Chief Engineer with responsibility for all system planning activities. On June 1, 1973, I was appointed Director of Planning and Power Supply. In 1977, I was elected a Vice President of New England Power Service Company, and in 1979 I was elected a Vice President of New England Power Company. I am a Registered Professional Engineer in the Commonwealth of Massachusetts and a Fellow of the Institute of Electrical and Electronics Engineers (IEEE). I have been a member of the NEPOOL Planning Committee since its inception in 1968. I served as Vice Chairman of that committee during 1971 and 1972, and as Chairman during 1973 and 1974. I have also served on various committees of the Northeast Power Coordinating Council, and am a member of the System Planning Committee of the Edison Electric Institute.

5. Q. What is the subject matter of your testimony?
   A. I will describe the objectives and functions of the New England Power Pool (NEPOOL) and in particular, the operation of hydroelectric generating facilities under NEPOOL dispatch. The hydro facilities owned by New England Power Company are operated under NEPOOL dispatch.
6. Q. Mr. Bigelow, would you please describe NEPOOL?
   A. NEPOOL consists of some 60 utilities in the six-state New England region and comprises something over 98% of the generating capacity and essentially all of the transmission network required to meet the needs of New England's electric customers. Included in those 60 utilities which are parties to the NEPOOL Agreement are the nine major investor-owned utilities in New England; three small investor-owned

utilities and a substantial number of municipals and co-ops. For convenience, I have attached to this testimony as Appendix 1 a map showing the locations of the principal generating stations and the high-voltage transmission network, and am supplying as Appendix 2 a copy of the NEPOOL Agreement.

The objectives of NEPOOL are described in Section 4.1 of the Agreement as follows:

"The objectives of NEPOOL are, through joint planning, central dispatching, cooperation in environmental matters and coordinated construction, operation and maintenance of electric generation and transmission facilities owned or controlled by the Participants and through the provision of a means for more effective coordination with other power pools and utilities situated in the United States and Canada,

(a) to assure that the bulk power supply of New England and any adjoining areas served by Participants conforms to proper standards of reliability, and

(b) to attain maximum practicable economy consistent with such proper standards of reliability, in such bulk power supply and to provide for equitable sharing of the resulting benefits and costs."

7. Q. How does NEPOOL implement these objectives?

A. Implementation of NEPOOL's objectives is carried out through three principal functions:

(1) Planning of the bulk generation and transmission as one integrated system;

(2) Operation of the bulk generation and transmission as one integrated system, which is accomplished through the NEPEX Dispatch Center and its four satellite dispatch centers; and

(3) Allocation of costs and savings resulting from pool operation on an equitable basis among the Participants.

8. Q. What are the benefits which accrue to utilities as members of NEPOOL?

A. Benefits which come from NEPOOL membership generally fall into two categories.

The first is an enhancement of reliability. The reserve generating capacity and transmission capability of all Pool members is available as backup to each Pool member during periods of difficulty on its system. This requires strong transmission interconnections and coordinated operation, which combine to make a substantial contribution to the reliability of all Participants.

The second is an economic benefit. As Pool members, Participants share in the economies of scale, which are made possible by:

(a) Large units planned and developed jointly by several Pool members under Pool coordination;

(b) Pool dispatch, which operates the system on a regional basis and permits these large units to be utilized effectively, and the overall system to be operated at minimum cost.

(c) Reserve sharing, whereby each company's individual reserve requirement is substantially less than it would be operating in isolation, because all the reserves throughout the Pool are shared;

(d) Access to a strong interconnected transmission network which permits backup for the loss of large units; and

(e) Access to all generating units which are installed in New England and the ability to purchase shares in them.

In addition, through the various NEPOOL committees, the expertise of all companies can be brought to bear on regional problems and help individual utilities develop their systems in the context of an overall Pool operation. In short, the Pool concept and its operating and planning functions are what make a large modern power system practical here in New England.

9. Q. What are the obligations which member utilities incur when they join the Pool?

A. There are four primary responsibilities which each Participant incurs:

1. *Capability Responsibility*

Each Participant must provide sufficient generation on its system, or outside its system but interconnected with the network, to meet its peak demand plus an allocated share of the Pool reserve. This is a reliability responsibility, i.e., to have sufficient capacity to meet peak requirements and maintain Pool reliability.

2. *Transmission*

Each Participant must provide its share of the transmission facilities which are needed to make the Pool work. It needs to be emphasized that transmission is the "glue" which holds the whole NEPOOL system together from a physical point of view.

3. *Poolwide Dispatch*

Each Participant must submit its bulk generation and transmission facilities to control by the NEPOOL dispatch center (NEPEX). This means that NEPEX calls the shots on how each Participant's system will be operated in order to coordinate all facilities, and to maintain overall system reliability and maximum economy of operation.

4. *First Options within the Pool*

All Participants in NEPOOL have essentially agreed to provide first option within NEPOOL on all purchases and sales of capacity and energy before consummating any such transactions with utilities outside NEPOOL.

10. Q. Specifically referring to the economic benefits of Pool dispatch, please explain how this is achieved.

A. Under Pool dispatch, all generating facilities throughout the six-state region are placed under the control of the NEPEX Dispatch Center. The computer system at NEPEX calculates the cost of generating throughout the region and assigns to each individual unit in New England its operating schedule in order to minimize the cost of the region's total supply. This means taking into account the different prices of fuel throughout the region, the different efficiencies of the various units and the fact that pumped storage and conventional hydro are limited energy sources and that the value of the energy in the various rivers and reservoirs can be maximized by scheduling these units when they will displace the most expensive energy which would otherwise have to be used anywhere in the region. It means that the units are operated regardless of company ownership or geography and the transmission

capability of the Pool allows power to flow in such a way that the total overall costs to the Pool are minimized.

11. Q. What magnitude of savings is achieved as a result of this Pool dispatch?

A. Savings have been very substantial over the years. In 1979, for example, the savings achieved by NEPOOL dispatch have been reported at somewhat over 44 million dollars. This is the savings in operating costs, primarily fuel, achieved with the systems operating under NEPOOL dispatch, as compared to how they would have been operated if each individual company had simply run its own generation to minimize the costs on an individual system basis.

12. Q. Would a limitation on hydro generation in a particular state have an impact on those savings?

A. I believe so. The best use of hydro is to schedule it so that its limited energy is used to displace the most expensive fuel on the system that it can. During certain periods of the year, when there is substantial flow in the rivers, hydro generation may well be exported and scheduled on a basis to displace generation anywhere in New England. Its value essentially is determined by the most expensive fuel that would otherwise be burned throughout the six-state region. At other times of the year, however, when water levels are low, there may well be economic steam generation in other regions of New England which would be imported into the areas where hydro facilities are located, permitting the local utility to back down its most expensive generation. It is a two-way street and its value is maximized when it is operated that way.

13. Q. Aside from the mechanics of central economic dispatch, is it physically possible to limit or prohibit the export of hydro power from a state in which it is generated?

A. Obviously, the answer to the question is yes, if you are willing to open all the transmission ties from that state to the rest of the region. This would clearly deprive that state of the benefits which can be achieved through Pool membership and interconnected operations with other utilities.

A second possibility would be to operate the system in such a way that net power was always imported when hydro generation was running. This would, again, deprive that state of the benefits of operating in a Pool system, because it could not have its generation operating under central dispatch for the benefit of the region as a whole.

To summarize, it is impossible to identify specific kilowatthours as coming from one source or another, once they are in the grid system. If any power is exported outside the network of a specific state, there is no way of establishing whether it comes from hydro, oil, nuclear, coal or whatever sources are generating at the time.

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(4.) PUC: PUC Staff Exhibit No. 9. Prefiled testimony of Lisa Gertler, as amended by PUC Staff Exhibit No. 10, without schedules (6-25-80).

Q. Please state your name, business address and occupation.

A. My name is Lisa Gertler and my business address is 8 Old Suncook Road, Concord, New Hampshire 03301. I am an economist with the State of New Hampshire, Public Utilities Commission.

Q. Would you please indicate your formal education and professional experience.

A. Yes. I graduated in December of 1978 with a Baccalaureate degree from Brandeis University with a major in economics. I joined the staff of the New Hampshire Public Utilities Commission in June of 1979 as a Public Utilities Examiner. In that capacity, I authored testimony regarding the conversion to coal of Public Service Company of New Hampshire's Schiller Station. I assumed my current position as economist in March, 1980. My most recent case filing has been in Docket No. DE 79-208 concerning the rates to be paid to small power producers and cogenerators under state law and the Public Utility Regulatory Policies Act. My responsibilities include analysis of ratemaking issues and implementation of the Public Utility Regulatory Policies Act of 1978.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to provide an economic analysis of the effect of limiting the exportation of hydropower from hydroelectric facilities owned and operated by New England Power Company within the State of New Hampshire.

Q. Which facilities are these?

A. The hydroelectric stations, or portions thereof which are located within the State are all on the Connecticut River. They are the Moore, Comerford and McIndoes dams, otherwise known as Fifteen Mile Falls, one-half of the

Wilder station, which generates electricity from two equal-sized units, and four-fifths of the Vernon station, which generates power from ten equal-sized units.

Q. What is the capacity and output of these units?

A. The maximum capability, or nameplate rating of these facilities is 328 (rounded) megawatts (MW). The output of the dams based upon a six-year average is 945,059 MWH (Schedule I).

Q. How could it be arranged that the power generated from these dams be restricted to benefit New Hampshire electric customers?

A. As with most sales from a specific generating station a unit power contract could be established between New England Power Company (NEPCO) and one or more New Hampshire electric utilities. Unit power sales are not handled for billing purposes through the New England Power Exchange (NEPEX) and so would not affect the economic dispatch system in terms of payment for the power. The hydroelectric power should, for equity purposes, be sold at its economic cost.

Q. What is economic cost?

A. Economic cost would include all costs associated with the dams and their operation including but not limited to depreciation, return on invested capital, operation and maintenance (O&M), and the allocated cost of water storage. Economic cost would not be, for instance, the value of power which is displaced by a purchase of hydroelectric power (decremental cost). An estimate of the economic cost of the hydro units located in New Hampshire on the Connecticut River, excluding the costs of water for power, is detailed on Schedule II.

Q. Would a substantial amount of power currently generated by oil in New Hampshire be displaced by this hydropower?

A. Yes. The ability to allocate the benefits of low-cost hydroelectric power to New Hampshire through billing mechanisms has not been disputed thus far in this docket. The allocation of the hydropower to New Hampshire would mean that, beginning with the most expensive generation, oil-fired electricity may be displaced by hydroelectricity. Public Service Company of New Hampshire (PSNH) maintains much more than 328 MW of oil-fired peaking generation, from which it generates power at far above its average marginal cost*.

Q. Will the cost of generating electricity be higher for NEPCO if the export of hydroelectric power is restricted?

A. Yes. Average cost will increase by a small percentage over what it might otherwise have been.

Q. Would PSNH's costs go down if it were to have access to the sum of all the energy produced by the hydro facilities?

A. Yes. The average cost of power to PSNH would drop substantially. The analysis herein was conducted to measure the magnitude of this change in the cost of service of both PSNH and NEPCO under the following conditions:

1) Export of hydropower from New Hampshire is prohibited.

2) All the power from the New Hampshire portion of the Connecticut River dams is sold to PSNH.

3) The change in allocation affects only fuel costs which are passed onto consumers on a constant KWH basis; that is there is no difference in fuel costs per unit among rate classifications although the contribution of fuel costs to total unit cost by rate class may differ. This includes the re-allocation of the economic cost of the hydro plants.

* See Docket No. DE 79-208 (Small Power Producers and Cogenerators) Testimony of Martin Ringo

Q. Is the total benefit (decreased system cost) realized by customers of PSNH the same as the total disbenefit (increased system cost) incurred by NEPCO customers?

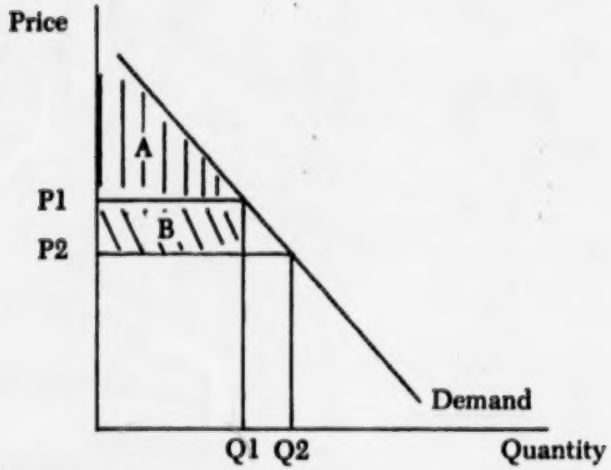
A. The reallocation of resources results in a decrease in total systems cost (PSNH and NEPCO) as a result of the greater utilization of NEPCO's existing low-cost (incrementally) excess capacity (i.e. the Bear Swamp Pumped Storage Plant). The Bear Swamp plant has not historically been fully utilized (see Schedule III). Without massive system-dispatch simulation, utilizing judgment, it is logical that the Bear Swamp plant would represent the "filler" should the export of hydropower from New Hampshire be prohibited. Further, the reallocation of the State of New Hampshire hydropower to the State of New Hampshire increases consumer welfare. The change in welfare is realized by consumers through the change in aggregate system(s) price; although the NEPCO system average price increases by a miniscule amount the PSNH system price decreases dramatically. Consumer welfare is typically measured by economists through the device of consumer surplus.

Q. What is consumer surplus?

A. Consumer surplus usually refers to the area to the left of an individual consumer's demand curve about the market cost of the good where

$$\text{Demand} = f(\text{Price})$$

For the purpose of this discussion price will equal average revenue per KWH by customer class. This area is also known as the sum of all the "reservation prices". A simple definition of the concept of consumer surplus should also state that the following holds true, in theory:



1) If area A is the amount of consumer surplus at price P1 and
2) Price were to decrease to P2 then
3) Consumer surplus would then include area A and area B.

The centerpiece of welfare analysis utilizing consumer surplus indicates that given a consumer's price* elasticity of demand a change in price will change the amount of consumer surplus. An increase in consumer surplus is an increase in consumer welfare. A decrease in consumer surplus is indicative of harm to consumers' welfare. The amount of consumer surplus can be variously interpreted as the amount of additional income the consumer would have been willing to spend on the good, at lower levels of

*Ratio of the percentage change in quantity demanded which is associated with a percentage change in price.

consumption in the case of a normal good, or inversely, an indication of the amount of income the consumer need not spend on the good to have it. If a budget constraint is introduced into the model, even further results may be obtained*.

Q. How does the concept of consumer surplus relate to the export of hydroelectric power from New Hampshire?

A. Economic criteria which evaluate policy actions on the basis of changes in the welfare of individual consumers are relevant to this discussion. Consumer surplus is a tool to measure changes in welfare of individual consumers or groups of consumers where the demand function is specified. Problems in economic analysis could arise when a policy change results in a redistribution of value between two consumers where the value cannot be quantified. For instance, if a theatre were to cancel a show and replace it with another, season subscribers X and Y would experience changes in the value of their tickets relating to their personal utility for the original and the new show. But because the subscribers had already purchased the product (season tickets) changes in quantity demanded, the result of personal utility functions and budget constraints, could not be observed empirically, even though the demand curve may have shifted. However, in the case of the production input of hydroelectric power, the ultimate consumer is blind to the input, but aware only of the price constraint, in a single-variable demand curve. The consumer can then change the quantity demanded (move along the demand curve). These changes can be measured historically and predicted empirically to quantify, in

*See Willig, R.D. "Consumer's Surplus Without Apology" *American Economic Review* Vol. 66 No. 4 September 1976. Additionally see the Technical Appendix.

dollars, the change in welfare due to a price change. Summed over all consumers affected the net effect may be observed. A budget constraint, introducing the element of relative income levels by state may be considered useful but has not been included in the analysis herein due to the difficulty of applying aggregated data. However, to guage the possibilities, the income levels by state are displayed on Schedule IV.

Q. How does an analysis of the change in consumer surplus assist in deciding the policy issue regarding the export of hydroelectric power?

A. The analysis of consumer welfare can determine whether a policy action would result in a net benefit to the sum of all consumers affected, whether positively or negatively by a policy change. Summed over all consumers, the net benefits or costs can be estimated in dollars.

Q. Doesn't the power-pooling system, where generating units are dispatched region-wide in order of their marginal cost provide that the benefits of the hydropower are already allocated to New Hampshire consumers?

A. The existence of power-pooling does not imply that the costs of supplying power to each state included in the pool are based upon that state's natural or other resources. Moreover, no analysis exists within the four corners of the Commission which purports to show that power-pooling allocates natural resources fairly, equitably or optimally, however these terms are defined.

Q. Would discontinuance of the export of hydroelectric power from New Hampshire pose a burden upon the stockholders of NEPCO?

A. In theory, the stockholders would remain indifferent to the reallocation of the hydropower unless the change in the generating mix of the utility were viewed by investors as changing the risk associated with holding the utility's

stock. If the regulatory agency captures the risks of common equity in the ratemaking process those stockholders will be paid the incremental change in risk premium as demanded in the marketplace for common stocks.

Q. Could you describe the two companies and their respective territories?

New England Power Company (NEPCO) is the wholesale and primary generating subsidiary of New England Electric System (NEES), a holding company. It is the major supplier of power to the three retail subsidiaries of NEES-Narragansett Electric Company, (NEC), Massachusetts Electric Company. (MEC) and Granite State Electric Company (GSE). The first company, (NEC) has some of its own steam generating capacity plus peaking generators. NEPCO makes some retail sales of its own. Sales to GSE constitute about 6.45% of all electric sales in New Hampshire (See Schedule V, Page 1 of 2) and about 3% of sales by the three retail subsidiaries of NEES (Schedule V, Page 2 of 2). NEES, through retail and wholesale sales has operated at times in five New England states in recent years. Most of their business however, as shown in accompanying schedules is derived from Massachusetts and Rhode Island.

Public Service Company of New Hampshire is both a retail and wholesaling electric company with 97% of its KWH sales made in New Hampshire. (See Schedule VI). For the purpose of analysis, only NEPCO (or NEES) will be analyzed in so far as the three sister subsidiaries make retail sales, (NEPCO sales for resale to affiliated companies are therefore ignored) and NEPCO (or NEES) will be treated as making sales to Massachusetts and Rhode Island only. Public Service Company will be treated as though all of its sales were made in New Hampshire unless otherwise noted and as if it were the only retail electric company in New Hampshire.

The distortions that may ensue are due to these limitations. The customer makeup for PSNH is slightly different than that of the State's electric utilities as a whole (see Schedule VII) and the cost changes affecting NEPCO will be less if part of the hydropower is allocated to GSE.

Q. Is there a market for the hydropower from the Connecticut River dams in New Hampshire?

A. Yes, there is, Schedule VIII details the generation mix of PSNH and NEPCO. As can readily be perceived, PSNH is heavily dependent upon oil generated electricity. This power is the most expensive to generate and if it is replaced by hydropower the result is to reduce fuel costs associated with electricity consumed in New Hampshire. NEPCO is also dependent upon oil-fired power, even with the conversion of Brayton Point Units 1 and 2 to coal. However, NEPCO's cost of service remains below that of PSNH (Schedule IX) and the rate of growth in its average system cost should slow once the Brayton Point conversion has been effected. NEPCO's cost of fuel remains below that of PSNH (Schedule X). Additionally, PSNH is experiencing greater growth in both sales and peak load than NEES, which will further widen the differential in fuel costs as PSNH requires more higher priced fuel to meet the increasing peak load (Schedule XI).

Q. How is the change in consumer surplus measured?

A. The change in costs to the two utilities involved is measured thusly:

(1) Determine the aggregate and per unit decremental (incremental) cost avoided (replaced) for each utility due to reallocation of the hydro resource.

(2) Determine the original consumption by class.

(3) Determine the incidence of the change in costs by customer class for each utility

(4) Determine the long-run change in quantity demanded by customer class for each utility.

(5) Determine the net change in total cost of service for each utility.

(6) Utilize (1), (2), (3), (4) to determine the change in consumer class for each utility according to the formula in the Technical Appendix.

(7) Compare (5) to (6) aggregated as a check. They should be equal with opposite signs.

In order to utilize the most up-to-date fuel cost data and more accurately reflect the tremendous changes in fuel costs evident in recent months, the latest available fuel cost data (Schedule X) was combined with an estimation of the fixed cost per KWH. The latter (Schedule XII, page 1 of 2), was based upon 1978 data and is useful for expository purposes. It is not meant however, to be a fully accurate representation of unit fixed cost. The estimated cost per KWH for each utility is shown on Schedule XII, page 2 of 2.

Utilizing avoided cost data for PSNH (Schedule XIII) and the cost of generation at Bear Swamp (Schedule XIV) the replacement (or displacement) cost of the hydroelectric units was calculated (Schedule XV). Using the consumption figures given on Schedule XVI and the incidence of the change in prices (Schedule XVI pages 2 and 3 of 3), the change in consumption was calculated, using the formula in the Technical Appendix. The results, in terms of cost of service by company, by class, in the aggregate and on a per unit basis, are on Schedules XVII and XVIII.

The final results show a net change in consumer surplus, (which may be interpreted as a net increase in income to customers) of $15.3 million per year, utilizing the most

current fuel data. Increased fossil fuel prices would make this figure grow. Of course this "net" figure is unevenly distributed by region and by class as Schedule XVIII, page 1 of 2 shows, given the assumptions used. However, the positive impact upon New Hampshire (PSNH) customers is almost ten times as large as the negative impact upon Massachusetts and Rhode Island (NEES) customers, on a per unit basis.

Q. Are there any circumstances under which this result could not be obtained?

A. Yes. The use of Bear Swamp in the previous equations is a function of the assumption that NEES is a cost minimizer and profit maximizer; that is, the Company would use its least expensive generating source with load characteristics similar to the hydro; as is available. The low annual capacity factors at Bear Swamp, historically, indicate availability unless power for pumping off-peak is unobtainable. Bear Swamp would appear to be the logical replacement for the hydro. However, if the assumption of cash-flow maximization is used instead of profit maximization, the hydro might be replaced by oil-fired power by NEES, in which case, it is likely that summed over all customers affected, consumer surplus would not change by very much.

Q. If there were to be no change in consumer surplus, has no one benefited and no one been injured?

A. Not necessarily. No net change in consumer surplus means that, in the aggregate the reshuffling of costs from one group of customers to the other has cancelled itself out. On a state by state basis, however, it is not likely that if the export of hydropower were restricted, the cost of electricity in New Hampshire would not be lower than it would otherwise have been, given no dramatic change in technology. In addition, because of the difference in the

size of the customer base, the price changes to individual customers would be more dramatic on the down side in New Hampshire than on the up side in Massachusetts and Rhode Island. The net change in consumer surplus though, tells us whether the whole region benefits by the change, as it does under the previously tested set of conditions.

Q. Are you making any recommendations based upon your analysis?

A. No. The analysis has been done to shed some light upon the economic possibilities given a change in policy regarding the export of hydropower. The Commission may want to consider this analysis in view of the statutory references to hydroelectric power regarding whether:

> ". . . such electrical energy or the portion thereof . . . is reasonably required for use within this state and that the public good requires that it be delivered for such use."(1)

or

> "as to the existence of an available market at fair rates within the state . . ."(2)

Q. Does that conclude your testimony?

A. Yes, it does.

(1) NH RSA 374:35
(2) NH RSA 374:36

(5.) PUC: Statement of George R. Gantz (7-8-80).

Honorable Commissioners, thank you for recognizing me and allowing me to make the following statement.

There is a great deal of misunderstanding concerning the modern electric utility system and the issue of Connecticut River Hydroelectric Power, and we would like, in this statement today, to clarify what these issues really mean.

RSA 374:35 was written long before the modern electric utility system, based as it is on extensive interconnection and power pooling arrangements, had developed. Nevertheless, the basic intent of the law remains the same. The legislature clearly identified hydroelectric power as an indigenous resource, the benefits of which should be available to the people of this state. We feel that the basic intent of this law is what should guide the PUC in its deliberations. According to RSA 374:35, it is incumbent upon the PUC to determine whether or not "such electrical energy . . . is reasonably required for use within this state and that the public good requires that it be delivered for such use." Given the intent of the law, this instruction means that the PUC must determine not just where the power is going, but, more importantly, where the benefits of that power are going.

Let me explain the significance of this interpretation by describing what actually happens to Connecticut River hydroelectricity in the modern electric power grid we have in New England. All the power plants in New England are dispatched by the New England Power Exchange, that is, one central agency determines when each plant is turned on and when it is turned off. The same is true of the Connecticut River hydroplants — they are owned by New England Power Company, but dispatched by NEPEX. The power plants are dispatched in accordance with the cost of fuel in order to meet the system-wide demand for power. The cheapest running plants are dispatched first, and the more expensive operating plants, such as the oil-fired plants, are dispatched only when

the system-wide demand for power is so great that there are no other cheaper sources with which to meet the demand. Hydro is a unique source of electricity, not only because the fuel is free and its operating costs are so low, but also because it is extremely flexible and can be adjusted to meet rapidly changing power demands. This ability to follow changes in the load is utilized extensively in New England throughout the day, and substantially increases the reliability of the whole utility system.

Let's suppose that an increased demand for power occurs in New Hampshire, in Public Service Company territory; further suppose that NEPEX decides to dispatch a Connecticut hydro unit to meet the load, because that is the cheapest unit available. The flow of power goes from the hydro site to consumers in New Hampshire. However, the situation is not that simple — we have to ask how the accounting is handled. New England Power is generating electricity for Public Service Company customers.

What happens is this: NEPEX calculates on a computer model what it would have cost Public Service Company to generate the power needed to meet its own customer demand. Suppose the next unit available in New Hampshire would have been the Newington Oil-Fired Station, and that the fuel cost at Newington were 6 cents per Kwhr. For the increased demand in PSNH territory that we hypothesized, NEPOOL would then charge PSNH 6 cents for every Kwhr. Meanwhile, New England Power was generating power to meet the load in PSNH territory, and was experiencing incremental costs of, say, 4 cents for every Kwhr generated. The difference between what NEPEX charges and what it pays is what funds the New England Power Pool.

But the consequence is this: even when New Hampshire consumers are receiving power from hydro-electric stations in New Hampshire, they must pay a rate as if the power were

being generated by a more expensive plant. This fact is based upon the agreement establishing the New England Power Pool and on the fact that the facilities are owned by a Company whose major load centers are not located in New Hampshire.

New Hampshire consumers do receive substantial benefits from the arrangement creating the New England Power Pool and from the increased reliability of the system resulting from the Connecticut hydro plants. They also receive tax and other benefits from the facilities. However, New Hampshire consumers are not receiving the benefits of lower cost hydroelectric power, even on those occasions when they actually receive their electricity from those facilities. The Governor's Council on Energy urges the Public Utilities Commission to consider these facts in its deliberations under DE 79-223. We think the intent of RSA 374:35 is clear, and that the burden of proof rests with New England Power Company to show that the existing arrangements are in the best interest of the New Hampshire consumer. Without such proof, we urge the Commission to take such action as may be necessary to assure that the New Hampshire hydro resources benefit New Hampshire consumers.

(6.) PUC: NEP Exhibit No. 7. Prefiled rebuttal testimony of Robert O. Bigelow (7-29-80).

Q. Please state your full name and business address?

A. My name is Robert O. Bigelow. My business address is 25 Research Drive, Westborough, Massachusetts 01581.

Q. By whom are you employed and in what capacity?

A. I am Vice President and Director of Planning and Power Supply of New England Power Service Company, which supplies many services, including professional engineering services, for companies in the New England Electric System. I am also a Vice President of New England Power Company.

Q. Have you previously testified in this proceeding?

A. Yes, and my qualifications are contained in that earlier testimony.

Q. What is the purpose of your testimony?

A. It is to present my opinion of certain assumptions contained in, and the conclusion of, a staff economic analysis. That analysis attempted to show the effect of limiting the exportation of New Hampshire hydropower owned by New England Power Company ("NEP").

Q. Please explain how the New Hampshire hydro units are dispatched in the NEPOOL System?

A. Dispatch of NEPOOL generation is performed by NEPEX. By a sophisticated on-line computer system and consistent with reliability requirements, NEPEX dispatches available generation on an optimal economic basis. "Economic" means more than just consideration of fuel costs. The dispatcher considers all factors that affect the total cost of generating electricity, looking at both daily and weekly load cycles. This is particularly important in the case of hydro generation, which is a limited energy resource. There is only so much water available for the day or week, and the dispatcher must schedule it to achieve the greatest economic benefit.

The Connecticut River hydro units, which include the New Hampshire units that are the subject of this hearing, are scheduled on a weekly basis to maximize the benefits of their limited energy subject to various constraints in required river flows. This is done by dispatching the hydro units to displace the most expensive thermal generation in the Pool, which would otherwise be run during the week.

These hydro units may be treated as peaking, intermediate, or base load units depending upon the river flow for that particular week. The large storage units at Fifteen-mile Falls, which include 379 MW in New Hampshire, operate at a capacity factor in the 20%-30% range and are almost always used for peaking purposes. The other plants farther down the river have little storage and operate as run-of-river units, usually on a daily cycle. Their New Hampshire capacity is approximately 40 MW, and they are typically used for intermediate type operation.

Q. When the New Hampshire hydro units are dispatched by NEPOOL, can it be determined which customers they are serving?

A. No. The NEPOOL dispatch of all New England generators serves all of the customers in New England. There is no way of knowing which generator serves which load. Thus, it cannot be stated which customers are served by the New Hampshire hydro units.

Q. Please explain how pumped storage generation, such as Bear Swamp, is dispatched on the NEPOOL system?

A. Bear Swamp generation serves as peaking capacity in the NEPOOL dispatch. Water is pumped from the lower reservoir to the upper reservoir generally at night and on the weekends when the cost to run thermal generation for pumping is low. The thermal generation used for pumping is the least expensive generation on an incremental

basis which is not already used to serve the load. The water in the upper reservoir is used to generate electricity generally during the weekday peaks when the marginal cost of thermal generation is high. NEPOOL operates the pumps whenever the thermal generation pumping cost times 1.41 is less than the incremental cost expected for thermal generation which would be replaced by running Bear Swamp generation.

Q. Earlier testimony has suggested that the Bear Swamp plant is underused from an economic standpoint. Do you believe this is true?

A. No, I do not. Bear Swamp is scheduled by NEPEX to operate when an economic benefit can be achieved. During many days in the year, there is little or no generation available at night which can pump power at a pump storage cost which will provide economic generation the following day. On such days, units still serve on a standby basis as fast-action reserve, but are not used for economic peaking. If it were economic to do additional pumping, NEPEX would do it as normal dispatch.

Q. Testimony has been presented in this case in which an economic analysis was based on the assumption that nuclear generation is available to provide pumping power for Bear Swamp. Is this a realistic assumption?

A. No.

Q. Please explain.

A. NEPOOL now has approximately 4300 MW of nuclear generating capability when all nuclear units are available and on line. The typical daily minimum load on the NEPOOL system runs in excess of 6000 MW. Even on the lowest hour of the year, which typically occurred this year over the Memorial Day weekend, the minimum NEPOOL load was 4852 MW.

While NEPOOL is the proper entity to consider, it may be noted that NEP has 384 megawatts of nuclear entitlements, while the bottom of its load curve is approximately 900 megawatts. Nuclear generation is the lowest cost thermal energy available and is therefore dispatched first. Thus, even during off-peak hours when pumping takes place, all nuclear generation available is required for load and pumping must be done with fossil thermal units.

Q. Considering planned maintenance and all other operating considerations, does NEPOOL have nuclear capacity available for pumping Bear Swamp?

A. NEPOOL does not have nuclear power available for pumping Bear Swamp.

Q. Will NEPOOL be able to pump Bear Swamp with nuclear power in the foreseeable future?

A. No.

Q. Assuming this Commission has the authority to direct NEP to enter a contract with the Public Service Company of New Hampshire ("PSNH") which transferred NEP's New Hampshire hydro units to PSNH, would NEPOOL dispatch change as a result of such a contract?

A. No. NEPOOL dispatches all New England units without consideration of financial support of the units. Thus, a change in financial support as the result of a unit contract would not change the NEPOOL actual dispatch at all. There would be no change in operation of Bear Swamp as the result of a unit contract sale of New Hampshire hydro from NEP to PSNH.

Q. If the initiation of a unit contract would not change the actual NEPOOL dispatch, then how does a unit contract affect the member companies of NEPOOL?

A. Unit contracts affect the billing between NEPOOL and each of the member companies. Such contracts, I understand, must be approved by the Federal Energy Regulatory Commission.

Q. Specifically, how would a unit contract sale of New Hampshire hydro from NEP to PSNH effect the member companies of NEPOOL?

A. A unit contract sale of New Hampshire hydro from NEP to PSNH would result in a redistribution of the benefits of this capacity among the member companies of NEPOOL. The principal beneficiary would be PSNH and the principal company harmed would be NEP.

Q. Would the total cost of supplying electricity to all New England customers change in any way as a result of a unit contract sale to PSNH?

A. No. There would be no change in the total cost of supplying electricity to New England customers as a whole.

Q. Are you aware of early testimony in this proceeding which suggested that there would be an overall savings in the cost of electricity to customers in New England as a result of such a unit contract?

A. Yes, I am and I disagree with that conclusion.

Q. Please explain.

A. From my standpoint, the basic flaw in that testimony is the assumption that Bear Swamp would be pumped by idle nuclear generation and thereby make up some economic loss which would be incurred by NEP as a result of the loss of the hydro energy. In fact, there is no such idle nuclear generation available within the NEP system or anywhere in NEPOOL.

The plain fact is that NEPEX is making the maximum economic use of the capacity available at Bear Swamp, and if it were not doing so, it would not be doing its job of economic dispatch. As I stated in my previous testimony, through NEPEX economic dispatch the NEPOOL utilities saved $44 million by comparison with operation on an individual basis. If more than $44 million in savings could have been achievable, NEPEX would not be doing its job.

Q. Mr. Bigelow, do you wish to make any concluding remarks?

A. The New Hampshire hydro units are valuable resources that play an important part in the NEPOOL dispatch to serve the customers of New England. They are dispatched by NEPOOL to maximize the benefits for all New England. A unit contract sale of these resources to PSNH would in no way affect the actual dispatch. It would, however, force the customers of NEP to pay more for electricity by an amount approximately equal to the amount that customers of PSNH would pay less for electricity.

b. New Hampshire Supreme Court ("NHSC").

(1.) NHSC: Affidavit of Frederick J. Nemergut (10-22-80).

1. I, Frederick J. Nemergut, am presently the Director of Economic Analysis and Planning for the Executive Office of Energy Resources of the Commonwealth of Massachusetts.
2. This position entails the monitoring of energy supply and demand for the Commonwealth and the Region, including electricity supply and demand, and formulating policies to deal with the cost of energy and possible interruptions in supplies.
3. After consulting with the appropriate members of my staff, I have assessed the amount of electricity supplied to the Commonwealth, and its municipalities, authorities and citizens, by the Massachusetts Electric Company ("MECo") and impacts of the recent decision by the New Hampshire Public Utilities Commission to withhold from export the hydroelectric energy generated by the New England Power Company ("NEPCo") in New Hampshire which had previously been sold, in part, to MECo for resale.
4. The retail sales of electricity by MECo to public and private customers within its service areas (see map of electric utility service areas in the Commonwealth attached and incorporated herein as Appendix "A") for the latest time period reported, 1979, is as follows:

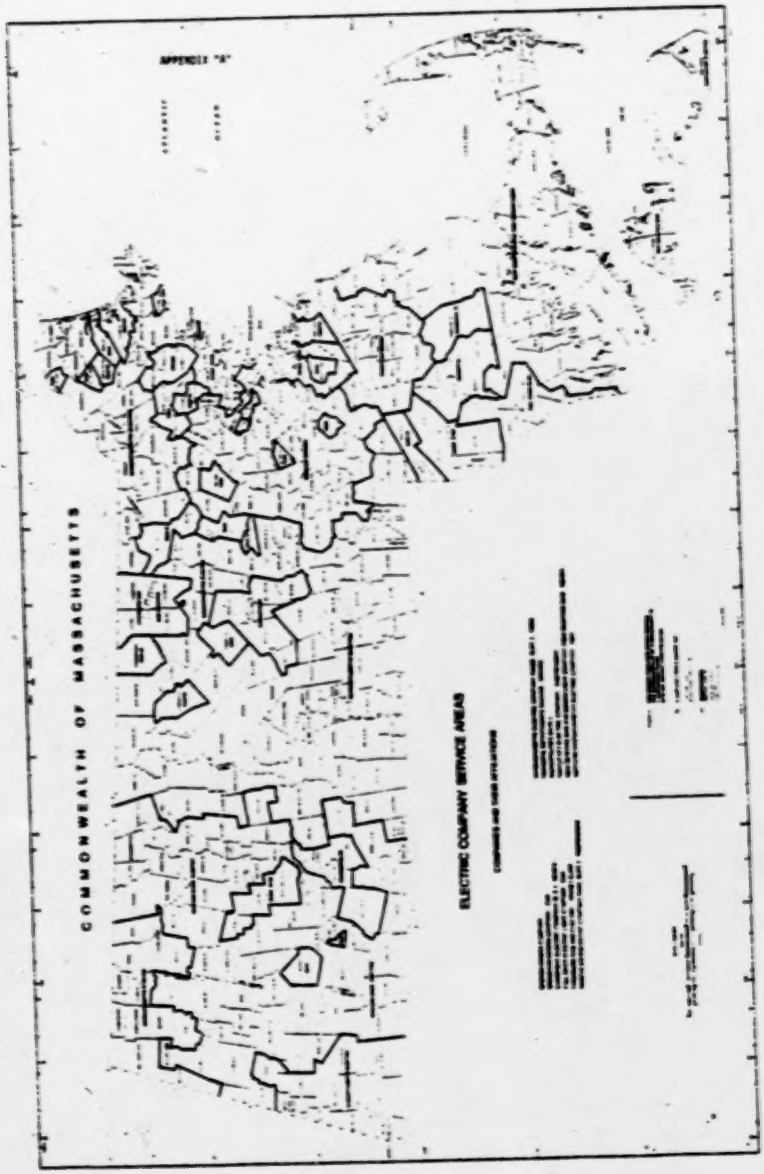
Customer Class	MECo Sales (MWH)*	Percent of NEPCo (NEES)**
Residential	4,336	73.8%
Commercial	3,491	70.6%
Industrial	3,101	80.0%
Street Lights	119	68.0%
Sales for Resale	5	0.6%
Losses and Internal Use	629	41.7%
TOTAL	11,744	67.4%

5. MECo sells this electricity to the citizens of the Commonwealth within its service area and to all of the municipalities within its service areas, such as the Cities of Worcester, Lawrence, Lowell and Methuen, and small towns such as Pepperell, Dunstable, and Tyngsborough. As well, State facilities within the MECo service areas, such as the Danvers State Mental Health Institution, Salem, Worcester and North Adams State Colleges and the University of Lowell, purchase electricity from the company.
6. In my opinion, if NEPCo is prevented from including hydroelectric energy produced in New Hampshire in its average running cost, which it charges to MECo for this sale of electricity, the immediate result will be an increase in the per-killowatt-hour cost of electricity to the citizens of the Commonwealth through payments made by the consumers, businesses, industries, hospitals, state facilities and municipalities within the MECo service areas.
7. Also, in my opinion, if the New Hampshire Public Utilities Commission estimate that the lower cost of hydroelectric energy produced by New England Power Co. in New Hampshire is $25,000,000.00 per year, then, assuming the demand mix for 1979 in paragraph 4., supra., remains approximately the same, then the annual cost to the citizens, municipalities, State institutions, businesses and industries will be *$16,850,000.00* per year, and will be reflected in property tax rates, increased costs of living and doing business.

*MWH = Megawatt-hours, or the equivalent of one million watts of energy used for one hour of time.
**MECo and NEPCo are subsidiary corporate parts of the New England Electric Systems, Inc., or "NEES".

/s/ DATE: October 22, 1980

Frederick J. Nemergut, Director
Economic Analysis and Planning
Executive Office of Energy Resources
[Witnessing omitted.]


APPENDIX "A"
COMMONWEALTH OF MASSACHUSETTS
ELECTRIC COMPANY SERVICE AREAS

Appendix "A."

(2.) NHSC: Supplemental Affidavit of Frederick J. Nemergut (11-5-80).

* * *

1. I, Frederick J. Nemergut, am presently the Director of Economic Analysis and Planning for the Executive Office of Energy Resources of the Commonwealth of Massachusetts.
2. This position entails the monitoring of energy supply and demand for the Commonwealth and the region, including electricity supply and demand, and formulating policies to deal with the cost of energy and possible interruptions in supplies.
3. After consulting with the appropriate members of my staff, I find it necessary to amend my affidavit of October 22, 1980 in Docket No. 80-396 by way of expanding on the impacts of the recent decision by the New Hampshire Public Utilities Commission to withhold from export the hydroelectric energy generated by the New England Power Company ("NEPCO") in New Hampshire which had previously been sold, in part, to Massachusetts Electric Company ("MECO") for resale.
4. In addition to the retail sales of electricity by MECO to public and private customers within its service areas, NEPCO sells wholesale power directly to municipally owned electric light companies within Massachusetts for resale to their customers. During 1979, these wholesale sales totaled 1,317,000 MWh of a total of 13,061,000 MWh sold in Massachusetts by NEPCO.
5. MECO provides direct service to the following agencies and departments of the Commonwealth: the Department of Environmental Quality Engineering; the Metropolitan District Commission; Department of Public Works; the Public Welfare Department; the Division of Employment Security; Military Divisions; the Registry of Motor Vehicles; the Massachusetts Port Authority; the Depart-

ment of Education, the Executive Office of Administration and Finance; the Massachusetts Defenders Committee; the Immigration Department; the Civil Defense Department; the Department of Mental and Public Health; the Executive Office of Energy Resources; the Department of Environmental Management; the Massachusetts Turnpike Authority; the State Police; the Department of Fisheries and Game; the Executive Office of Economic Affairs; the Massachusetts Bay Transit Authority; the Division of Parks and Recreation; the Correctional Department; and the Marine and Fisheries Department.

On an annual basis, this amounts to $6,000,000 in expenditures of tax revenues which would be increased if the P.U.C. decision to prevent exportation of hydroelectric energy remains in effect.

6. The various municipalities within the MECO service areas expended $11,700,000 in revenues to pay MECO for street lighting in those various municipalities.
7. The energy currently used by NEPCO from these hydroelectric facilities must be replaced in the near term from existing energy sources. The replacement fuel will be oil given the fact that all NEPCO's existing nuclear and coal-fired capacity is presently base-loaded with no additional energy available. This distribution of oil-fired energy for hydroelectric energy will result in an increase in the cost of fuel to the Massachusetts ratepayers of NEPCO and MECO. This increase in NEPCO's fuel cost, which will be passed on directly through the Fuel Adjustment Clause, is estimated to be in the range of $51.9 million to $111.5 million per year based on today's fuel costs. In future years, this additional fuel cost can be expected to escalate at an annual rate proportional to the annual rise in the cost of oil.

8. The ratepayers of MECO are paying $5,000,000 on an annual basis to provide a return on the investment in the hydroelectric generating facilities in New Hampshire that will be no longer "used and useful" to them. The revenues generated by a unit contract for the energy from these facilities will not be credited to these ratepayers but to NEPCO only.
9. A widening of the disparity of energy costs between the Commonwealth of Massachusetts and the State of New Hampshire in New Hampshire's favor would increase the likelihood of industry choosing to locate or relocate in New Hampshire, impacting adversely the revenues of the Commonwealth associated with property, business income and personal income taxes.
10. In addition to the loss of hydroelectric energy, NEPCO may need to replace the 420 MW of hydro capacity. According to the New England Electric System (NEES) corporate planning model, "NEESPLAN 1980-1995", a reduction in NEPCO's power supply capacity by the 420 MW will result in altering the time frame of future additions to capacity. The result is to advance by perhaps six years, the point where projected supply no longer meets projected capacity requirements. To satisfy the deficity is not a simple matter. In the time frame in question there are few alternatives of sufficient capacity to help satisfy NEPCO's capacity needs. There is also insufficient lead time for construction by NEPCO of a coal fired unit before the end of the NEEPLAN study period given the present regulatory climate.

DATE: November 5, 1980

Frederick J. Nemergut, Director
Economic Analysis and Planning
Executive Office Of Energy Resources

[Witnessing omitted.]